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Readers of this class will doubtless find this book of great interest, and the general view and perspective of the subject will also be of value to the professional physicist. It is written with the spirit and enthusiasm which we have learned to expect from Sir Oliver Lodge since the publication of his 'Modern Views of Electricity'—nearly twenty years ago—that remarkable little book which, by a masterly use of mechanical analogies and models, gave an exposition of Maxwell's theory that was understood and enjoyed by many non-mathematical readers and was at the same time capable of exciting the admiration of Helmholtz. It can not be said that the present work is the equal of the earlier book; but taken together they afford a view of the progress of electrical theory during the past thirty years which can hardly be got elsewhere in the same compass.

H. A. BUMSTEAD

YALE UNIVERSITY

SOCIETIES AND ACADEMIES

THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 191st meeting of the society, held on Wednesday, April 10, Mr. F. E. Wright exhibited four new attachments for the petrographic microscope and gave a brief description of each: (a) Double screw micrometer ocular by means of which the optic axial angle of any section under the microscope can be measured in convergent polarized light, if one optic axis, at least, appears within the field of vision. (b) A special cross-section ocular, which consists of a Ramsden-Czapski ocular with a fine coordinate scale in the focal plane and which serves the same purpose as the double-screw micrometer ocular, although slightly less accurate. (c) An improved Fedorow-Fuess universal stage on which new hinged graduated circular scales have been added and found to increase the general applicability of the stage considerably. (d) A new condenser-lens system combining the advantages of the ten Siethoff system with the quantitative movements of the universal stage.

Regular Program

Mr. Bailey Willis discussed the geological problem of the Alps especially from a structural standpoint and compared the conclu-

sions reached by him with those held by the majority of European students of the Alps.

At the 192d meeting of the society, on April 24, Mr. Bailey Willis presented and briefly explained a diagram on the possible development of recumbent folds as a consequence of thrust faults of great magnitude. This paper will be published in SCIENCE.

Mr. F. L. Hess exhibited informally specimens of gypsum from Lost Hills, fifteen miles south of Tulare Lake, California.

Regular Program

A Peculiar Form of Metamorphism in Siliceous Sandstone: MR. GEO. P. MERRILL.

Mr. Merrill described a peculiar and apparently very local form of metamorphism of the siliceous sandstone which underlies the Aubrey limestone in the vicinity of Canon Diablo, Arizona. The materials shown and discussed were from the so-called Coon Butte Crater, and were of unusual interest, not merely on account of the character of the phenomena, but as bearing upon the question of the origin of the crater itself.

It was shown that the sandstone, composed of very pure quartz sand, passed by gradations into an almost wholly crystalline rock composed of remolded quartz granules with a well-developed rhombohedral cleavage, and thence into glassy and pumiceous forms closely resembling a bleached liparite pumice. The metamorphism was accompanied by no apparent chemical changes that could be considered constant or essential. Mr. Merrill discussed the bearing of this metamorphism upon the origin of the crater, but refrained from committing himself upon the subject.

Normal Faulting in the Bullfrog District:

W. H. EMMONS. This paper will be published in SCIENCE.

Some Problems Concerning the Formation of Coal: DAVID WHITE.

Under this title Mr. White presented an outline of the more important questions relating to the deposition of vegetable matter and its transformation into coal. He observed that the 'transportation' theory appeared to be fully vindicated in a number

of instances, though in the vast majority of cases the plant material seemed to have undergone little, if any, appreciable drifting. The great extent and regularity in thickness, including partings and benches, of the Pittsburgh bed in the Appalachian trough appeared not to find a completely satisfactory explanation in either the transportation or the peat-bog theories. Referring to the fact that the process of coal formation is marked chiefly by the progressive deoxygenation of the vegetable matter, especial attention was directed to the most important rôle played by anerobic bacteria in the decomposition of the plant tissues and their incipient coalification. Though it is not yet determined how far bacterial action may have gone in changing vegetable matter into bituminous coal, etc., the function of these deoxygenating organisms in accomplishing the primary stages of coal formation, including at least the breaking down of the vegetable hydrocarbons and the development of the fundamental jelly, is now rapidly gaining acceptance on the part both of geologists and of chemists. Concerning the successive development of lignites, bituminous coals and anthracites there still remain radical differences of opinion, it being maintained by many, including several paleobotanists, that the higher grades of coals have never passed through a peaty, lignitic or other lower stage. The solution of this problem, whose principal point is the origin of the bituminous coals, is awaited with the greatest interest. The speaker urged that the cause of anthracitization in the Eastern Appalachian regions rested primarily not in local folding, but in the deeper-seated metamorphism due to the great post-Carboniferous Atlantic thrust. This is shown by the progressive devolatilization of the coals in passing eastward across the Appalachian basins. The folding was merely incidental and relieving.

Another group of problems involves the determination of the very intimate and important relations existing between the kinds of original contributory organic matter and the kinds and qualities of the resultant fuels. It is known that certain groups of coals owe their principal distinctive features to the na-

ture of their original constituents. In this connection the speaker suggested that the coking property in some of the Appalachian coals was probably due to a combination of 'sapropelic' (fatty) or strictly bituminous organic matter, with the ordinary 'humic' (jetty, brilliant) or so-called 'bituminous' coal-forming material, which is largely composed of the remains of the higher types of plants.

Emphasis was put on the urgent need for new and more complete experiments in synthetic coal-making, concerning which the testimony of previous experimenters is highly conflicting. Such experiments carried out with new and more adequate methods and equipment, comparable to those employed in the Geophysical Laboratory of the Carnegie Institution, would not only furnish most valuable data relating to coal transformation, but they would also probably furnish a conclusive answer to the question of the development of bituminous coals or anthracites through peat, lignite, or subbituminous coal stages.

The Jamaica Earthquake: Mr. J. W. SPENCER.

Jamaica is separated from the volcanic and earthquake zone of the Windward Islands by the broad deep basin of the Caribbean Sea, nearly 1,000 miles across, and from that of Central America by about 600 miles. Jamaica is on a plateau connecting this latter region with Haiti; but much the greater part of the intervening distance between the Central American volcanic and earthquake zone and the island is occupied by low plains, or these only slightly submerged beneath the sea, and crossed by one relatively narrow channel reaching to a depth of nearly 3,000 feet. The trend of this Jamaican ridge being at right angles to the lines of the earthquake actions of the two ends of the Caribbean Sea, it would seem that the seismic effects could not have any relationship with others of the region so far away. Moreover, Jamaica is not volcanic, with only the remnants of one Pliocene volcano upon the northern coast. On its southern side, which is mostly a plateau from one to two thousand feet high, capped by white Oligocene limestones much denuded, a coastal

plain extends some ten miles seaward under less than 100 feet of water. Above the sea the plain is only five or six miles wide to the base of the mountains. Kingston is situated on the side of a long narrow bay separated from the sea by a beach ridge called the Palisades, on the point of which is Port Royal. A short distance east of Kingston the mountains come to the sea, which suddenly deepens to 500 feet within a half mile of the shore. This is the head of an embayment in the mass of submerged land, and plunges rapidly to a depth of 4,000 feet. Beneath the limestones mentioned are Pteropod oozes, which are exceedingly plastic when wet. The earthquake, while felt over the island, was only intense about Kingston, and still more so to the east at the head of the submarine embayment mentioned. As this is the second great earthquake which has occurred here within recent times, Mr. Spencer was inclined to regard this local feature of the deep embayment as its direct cause; and suggested that it might possibly be due to a gigantic submarine landslide originating perhaps at a depth of 4,000 feet or more. The land appears to have shifted and part of the beach of Port Royal has sunken beneath the sea, which is a repetition of the features of the former earthquake. While part of the possible submarine shifting is due to this material, as at Port Royal, a greater cause might be found in the movement of the consolidated beds over the Pteropod ooze similar to gigantic creeping over similar beds in Barbados.

FRED E. WRIGHT,
Secretary

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

THE 635th meeting was held on May 11, 1907.

Mr. Becker read a paper on current theories of slaty cleavage which will soon appear in the *American Journal of Science*. The speaker first mentioned very briefly the views of various writers concerning the origin of cleavage, but dwelt at some length upon the theories of Sharpe, Van Hise and Leith. Sharpe's theory was that cleavage is due to pressure normal to the cleavage plane. Sedg-

wick and others held cleavage mainly a phenomenon due to crystallization or recrystallization of minerals in an appropriate orientation. Messrs. Van Hise and Leith have sought to combine and amplify these theories. They hold that minerals, especially mica, tend to crystallize perpendicularly to the greatest stress and also perpendicularly to the least axis of the strain ellipsoid.

Mr. Becker pointed out that the chances of a pure strain, such as called for by Sharpe's theory, are extremely small, not more than one in 10,000 and probably much less. The surfaces perpendicular to the greatest internal stress in a homogeneous mass subjected to progressive uniformly distributed normal external pressure are the equipotentials and are well known to be hyperboloids of revolution. They are thus surfaces of double curvature corresponding to no known phenomena in slates. In the case of rotational strains the equipotentials would be still more complex and become intersecting systems of surfaces of double curvature, and thus still less available to explain cleavage.

Mr. Becker took up one by one the lines of evidence presented by Mr. Leith to establish the position of the strain ellipsoid and the hypothesis that the least axis is normal to the cleavage. The elongation of pebbles is not applicable to this purpose, for the final form and attitude of a pebble result from the superposition of the strain ellipsoid and the rotation of the strain on the original ellipticities of the pebble. Its elongation does not even tend to coincide with that of the strain ellipsoid excepting in highly exceptional limiting cases. Numerical examples were given showing that pebbles of ordinary forms may be elongated in directions 20° or 30° from the major axis of the strain ellipsoid. Fossils as hitherto treated afford no better guide.

Mr. Becker showed that the slicing of pebbles could be satisfactorily explained on the theory that cleavage as well as jointing occurs on planes of maximum slide. He rejected Mr. Leith's inferences from the evidence and concluded:

It appears to me that Mr. Leith is in duty bound to make public exact reasons for his asser-

tions, to give precise methods for determining the position of the strain ellipsoid or the equipotentials in a slate, to show why there is no cleavage on planes of maximum slide, and to explain thermodynamically how it happens that the planes on which the entire energy of deformation is expended are not those on which feldspar is converted into mica. We are past the stage in which mere opinions or general impressions should be allowed decisive weight.

At the conclusion of Mr. Becker's paper its discussion was taken up by Mr. Bailey Willis with special reference to other theories of rock cleavage. Mr. Willis called attention to the very broad observational basis of the explanations of rock cleavage given by Messrs. Van Hise and Leith and pointed out that Mr. Becker approached the problem as one of pure mathematics and solved all the complex phenomena by a single theoretical application of principles. Granting the correctness of the principles and their appropriate application to a purely mechanical distortion, one may very reasonably question their adequacy to explain the facts emphasized by Leith, namely, the rearrangement and recrystallization of minerals with parallel orientation of crystal-line cleavage and major axes of particles.

Leith recognizes a variety of cleavage (fracture-cleavage) developed in the planes of maximum slide, as Becker calls them, but limits that development to the zone of fracture. Willis took exception to this limitation and expressed the view that in regions of great tangential movement displacement on planes of maximum slide (*i. e.*, on planes oblique to the direction of tangential pressure) may occur in a deep-seated zone, where fracture is impossible and flow cleavage develops by recrystallization and orientation in those oblique planes. The Appalachian region of North Carolina appears to present such displacement with appropriate cleavage.

On the other hand, there are regions where the movements of large masses are essentially vertical, as is shown by warping of the surface. Such an area is that of the Canadian Highlands. In so far as the vertical swelling may be attributable to tangential stress it indicates vertical elongation of the mass, which may be

and probably is accompanied by recrystallization and orientation of mineral particles, producing flow cleavage in the normal planes.

Thus it seems probable that cleavage involves molecular rearrangement, of which Becker does not take sufficient account, and that flow cleavage may develop in oblique planes, which Leith does not consider, as well as in the normal planes, which he does recognize.

R. L. FARIS,
Secretary

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

The annual meeting of the Washington Anthropological Society was held May 28, 1907, with Mr. J. D. McGuire in the chair. The program consisted of the annual report of the treasurer; preliminary communications; notices of deceased members; and annual election of officers.

The treasurer's report showed that during the fiscal year ending December 31, 1906, the total receipts amounted to \$587.78, the total expenditures to \$398.22, leaving a balance of \$189.56.

Mr. Hewitt presented an extract of the monthly field report of Dr. J. R. Swanton, bearing on the scattered remnants of the Indian tribes in Louisiana.

The obituary notices were delivered as follows: (1) Dr. Cyrus Thomas on Dr. Ernst Foersterman, of Germany, honorary member of the society, born 1818, died 1906. Special reference was made to his contributions to the knowledge of the Maya hieroglyphics. (2) Professor W. H. Holmes on Sr. Alfredo Chavero, born in Mexico, 1822, died 1906. He was equally eminent as litterateur, statesman and archeologist. (3) Mr. J. Mooney on Dr. Albert S. Gatschet, born in Switzerland in 1832, died in Washington, 1907. Dr. Gatschet was for many years on the staff of the Bureau of American Ethnology, and devoted himself principally to the linguistics of the American aborigines, in which field he was a successful pioneer. (4) Dr. A. Hrdlička presented a notice on Professor Emil Schmidt, born in 1837, died in 1906, in Germany. Professor Schmidt's spe-

cial field was physical anthropology, in which he did great service in Germany. He contributed important studies to the anthropology of Egypt, South India and Ceylon, and particularly to that of the prehistoric times in North America, which country he twice visited.

The election of officers for 1907-8 resulted as follows:

President—Aleš Hrdlička.

Vice-presidents—Section of Somatology, D. S. Lamb; Psychology, J. W. Fewkes; Esthetology, W. H. Holmes; Technology, Walter Hough; Sociology, James Mooney; Philology, J. N. B. Hewitt; Sophiology, Alice C. Fletcher.

General Secretary—Walter Hough.

Secretary to Board of Managers—J. R. Swanton.

Treasurer—Geo. C. Maynard.

Curator—Marianna P. Seaman.

Councilors—J. W. Fewkes, J. B. Nichols, James Mooney, J. N. B. Hewitt, J. R. Swanton, W. E. Safford, F. W. Hodge, J. M. Casanowicz, Sarah S. James, P. Beckwith and F. O. Stetson.

Committee on Communications—W. H. Holmes, Alice C. Fletcher, James Mooney.

J. M. CASANOWICZ,
Acting Secretary

THE CHEMICAL SOCIETY OF WASHINGTON

THE 175th regular meeting of the Chemical Society of Washington, and joint meeting with the American Society of Biological Chemists was held at the Cosmos Club, May 9, 1907, Dr. Peter Fireman, of the Chemical Society, and Dr. W. J. Gies, of the Biological Society, presiding.

The following program was carried out:

Chemical and Bacteriological Standards now in Use in Water Analysis: JOSEPH H. KASTLE.

Ammonia in Milk and its Development during Proteolysis under the Influence of Strong Antiseptic: H. C. SHERMAN, W. N. BERG, L. J. COHEN, and W. G. WHITMAN.

Studies on Apple Juice: H. C. GORE.

Sugar Metabolism: HUGH MCGUIGAN. (Read by title.)

The Presence of Secondary Decomposition Products of Proteids in Soils: OSWALD SCHREINER and EDMUND SHOREY.

On Lysylglycin: P. A. LEVENE and W. A. BEATTY.

Negative Evidence of the Development of Ferments of Dog's Saliva in Adaptation to Diet: WALTER E. GARRY. (Read by title, but results of investigation were discussed by Dr. L. B. Mendel and Dr. W. J. Gies.)

Some Azolitmin Compounds of Mucoids, Nucleoproteins, and other Proteins, with Exhibition of Products: JACOB ROSENBLUM and W. J. GIES.

On the Quantitative Determination of Mucoid in Urine, Blood and Tissue Extracts: C. E. MAY and W. J. GIES.

J. A. LECLERC,
Secretary

THE TORREY BOTANICAL CLUB

THE meeting for May 14, 1907, was called to order at the American Museum of Natural History with President Rusby in the chair. One hundred and four persons were present.

The scientific program consisted of a symposium of four papers on the subject of 'Trees.' Each paper was illustrated by lantern views. The symposium was opened by Professor L. M. Underwood, who spoke on 'Some Historic American Trees.' Mr. William Solotaroff discussed 'The Planting and Care of Shade Trees,' giving an interesting account of the preparation for planting in the nursery, methods of transplanting along highways and streets, the dangers that threaten shade trees, and briefly of the means of protecting against these dangers.

Dr. E. B. Southwick spoke on 'Trees in Winter,' showing views taken in Central Park, and elsewhere in and about Greater New York. The last number was by Dr. N. L. Britton, who showed a selection of colored lantern slides from the Van Brunt collection, illustrating the flowers and fruits of common trees.

At the conclusion of the regular program, Mr. Edward R. Taylor, of Pen Yan, N. Y., exhibited some beautiful, and botanically interesting, samples of 'vegetable silk,' and fabrics woven from it, together with the raw material of which it is made. The process of its manufacture from cotton-seed-cellulose

was briefly described, and samples of 'artificial horse-hair,' made by treating ordinary cotton thread with the dissolved cotton-seed-cellulose, were also exhibited and the process of its fabrication briefly described.

C. STUART GAGER,
Secretary

IOWA ANTHROPOLOGICAL ASSOCIATION

THE fourth yearly meeting of the Iowa Anthropological Association was held at the Davenport Academy of Sciences, Davenport, Iowa, on Friday and Saturday, May 17 and 18, the sessions being well attended. On Friday evening Professor Frederick Starr, of the University of Chicago, delivered an address on 'The Field of Folk-lore in Mexico,' illustrated with stereopticon views. On account of his numerous trips to Mexico and his intimate acquaintance with the people of that country, Professor Starr's address was of unusual interest.

On Saturday morning, after some introductory remarks by the president, Professor B. F. Shambaugh, of the University of Iowa, and the report of the secretary, J. H. Paarmann, curator of the Davenport Academy of Sciences, there were a number of papers by members of the Davenport Academy of Sciences dealing with different aspects of the explorations recently made near Albany, Whiteside County, Illinois. These were as follows:

EDWARD K. PUTNAM: 'Bibliography of the Albany Mounds.'

PROFESSOR SAMUEL CALVIN, University of Iowa: 'The Geology of the Region in the Vicinity of Albany.'

W. H. KIMBALL: 'Report of the Survey of the Albany Mound District.'

J. H. PAARMANN: 'Report of the Opening of Two Mounds Near Albany.'

DR. A. W. ELMER: 'Iron found in the Albany Mounds.'

J. E. CALKINS: 'Some Puzzles at Albany.'

After luncheon at the Davenport Commercial Club, various papers on current anthropological topics were presented as follows:

RICHARD HERRMANN, Dubuque, Iowa: 'Mound Builders of the Mississippi Valley.'

PROFESSOR BOHUMIL SHIMEK, University of Iowa: 'The Loess and the 'Nebraska Man.''

PROFESSOR C. C. NUTTING, University of Iowa: 'Urn Burial on the Island of Ometepe, Nicaragua.'

RABBI W. H. FINESCHreiber, Davenport, Iowa: 'Some Facts of Jewish Anthropology.'

PROFESSOR FREDERICK STARR, University of Chicago: 'The Davenport Academy's Collection of Objects from the Upper Kasai, Congo Free State.'

The following officers were elected:

President—Edward K. Putnam.

Vice-President—Bohumil Shimek.

Secretary—J. H. Paarmann.

Treasurer—A. G. Smith.

Executive Committee—F. J. Becker, I. A. Loos, G. T. Flom, C. C. Nutting and A. W. Elmer.

On Saturday evening a meeting was held to organize an Iowa branch of the American Folk-lore Society, the program being as follows:

EDWARD K. PUTNAM, Davenport Academy of Sciences: 'Introductory Remarks on Folk-lore.'

PROFESSOR CHARLES BUNDY WILSON, University of Iowa: 'German-American Folk-medicine.'

PROFESSOR G. T. FLOM, University of Iowa: 'The Myths of Creation and Doom in Norse Mythology.'

PROFESSOR JULES MAURITZON, Augustana College, Rock Island, Ill.: 'Traces of Old North Heathenism in Swedish Christmas Customs of To-day.'

Professor Charles Bundy Wilson, of the University of Iowa, was elected president and Edward K. Putnam, of Davenport, secretary.

J. H. PAARMANN,
Secretary

DISCUSSION AND CORRESPONDENCE

THE FIRST SPECIES RULE: AN OBJECTION

TO THE EDITOR OF SCIENCE: The rules that have been drawn up by a committee of American zoologists, with a view of determining the genotype of every genus in a manner that can admit of no uncertainty, may perhaps not yet have been published, but, to judge from the manuscript copy which I have been permitted to see, they are admirably adapted to secure their object. The question remains whether the object is a good one; and it is the purpose of this letter to point out a set of cases in which the selection as genotype of the